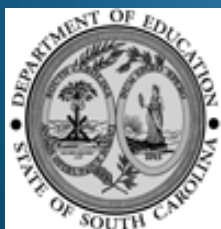


Probability and Statistics in the Algebra I Common Core Classroom



SOUTH CAROLINA
STATE DEPARTMENT
OF EDUCATION

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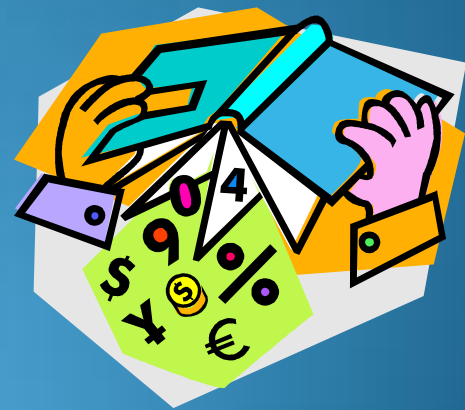
Algebra I Gap Analysis



New Topics to Algebra I

- Algebraic and Geometric Sequences
- Average Rate of Change
- Statistics

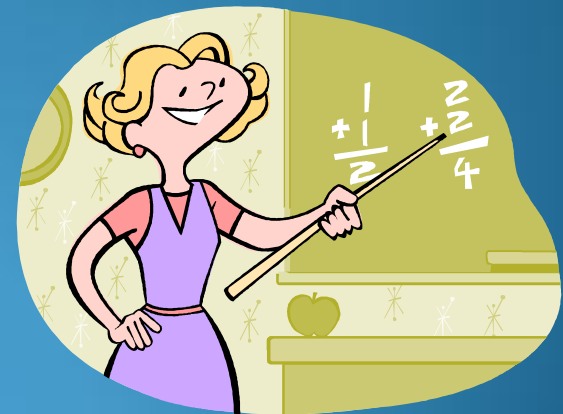
STATISTICS



Algebra I – Statistics Standards

- Represent data with plots on the real number line (dot plots, histograms, and box plots). (S.ID.1)
- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. (S.ID.2)
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). (S.ID.3)

Terms to Review



Measures of Center

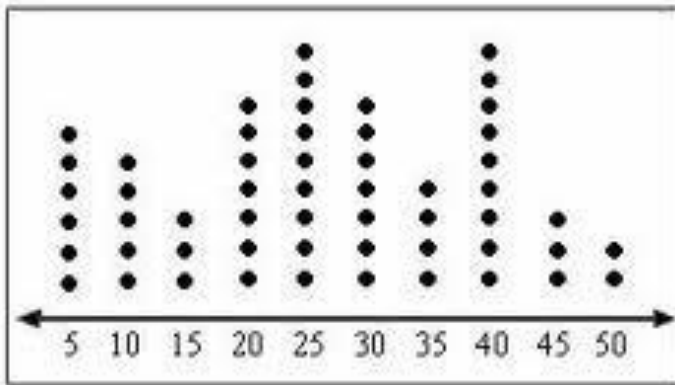
- mean (\bar{x}) – average
 - * Most used measure of center
 - * Not resistant to outliers
- median (M) - the middle number or the average of the middle 2 numbers in a set of ordered data
 - * Not affected by outliers – a resistant measure of center (the most appropriate measure of center when outliers are present)

Measures of Variability

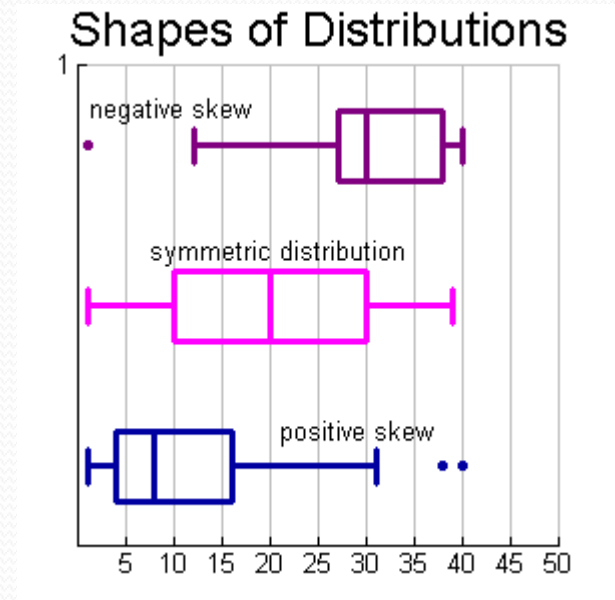
- Variance (σ^2) – the average of the squares of the distances each value is from the mean (how much the data set varies from its mean)
- Standard Deviation (σ) – square root of the variance
 - *most frequently used measure of variability because it returns the variance to the original units of measure of the data set
- Interquartile Range (IQR) Difference of the upper and lower quartiles
 - *used when the median is the most appropriate measure of center

Graphs

Dotplot



Boxplot



Checking For Outliers

- Interquartile range (IQR) - Upper quartile minus lower quartile

$$\text{Formula: } \text{IQR} = Q_3 - Q_1$$

- Outlier(s) – extremely high or low number(s) in a set of data

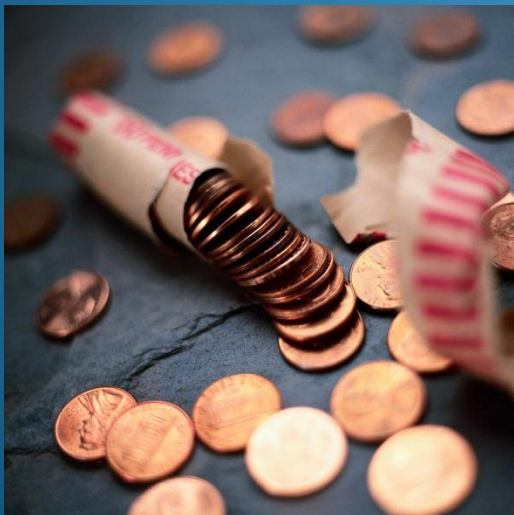
Any number in the set of data that is lower than (formula: $Q_1 - 1.5 \times \text{IQR}$) or any number in the data set that is higher than (formula: $Q_3 + 1.5 \times \text{IQR}$) is an outlier.



Group Work Activity

Pennies' Dates Activity

Work with a partner. You will need a TI-83 Graphing Calculator and 50 pennies.



Share With Other Groups

Compare your graphs, measures of center, and measures of variability.

Lunch



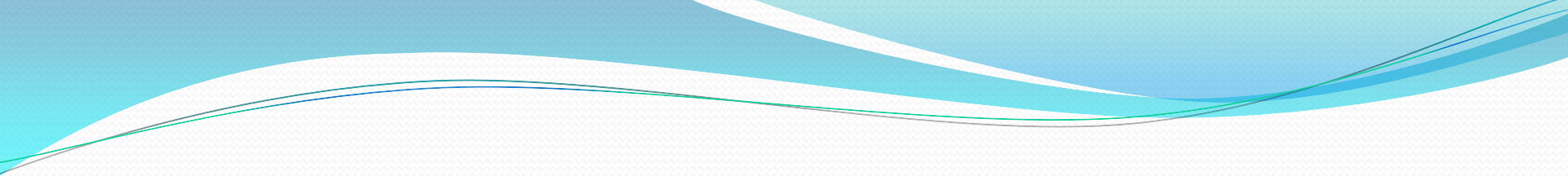
Algebra I – Statistics Standards

- **Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. (S.ID.5)**

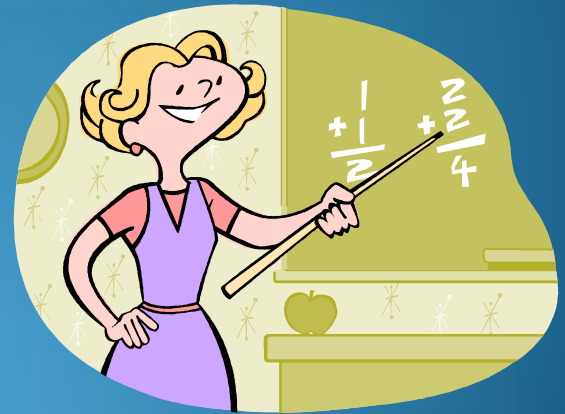


Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

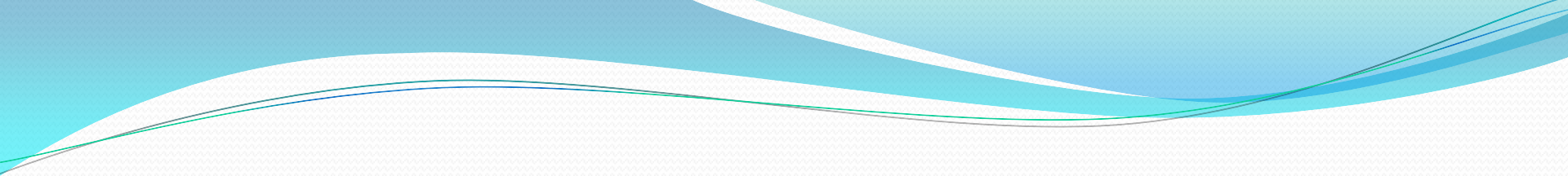
- **Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* (S.ID.6a)**
- **Informally assess the fit of a function by plotting and analyzing residuals. (S.ID.6b)**
- **Fit a linear function for a scatter plot that suggests a linear association. (S.ID.6c)**

- 
- **Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. (S.ID.7)**
 - **Compute (using technology) and interpret the correlation coefficient of a linear fit. (S.ID.8)**
 - **Distinguish between correlation and causation. (S.ID.9)**

Terms to Review



- **two-way table** – a rectangular table that consists of a row for each category specified by the first variable(x) and a column for each category specified by the second variable(y). Usually specified by the number of columns(c) and rows(r), $r \times c$, read “ r by c ”.
- **cell** – the intersection of a row and column in a two-way table
- **cell count** – the numeric value in the cell of a two-way table

- 
- **marginal totals** – obtained by adding the cell counts for each row and column of a two-way table
 - **table total** – obtained by adding all of the cell counts in a two-way table
 - **marginal relative frequency** – the ratio of the marginal total to the table total
 - **joint relative frequency** – the ratio of the cell count to the table total

Describing A Scatterplot

- **Association – slope – positive, negative, or no association**
- **Shape – linear, curved, or no shape**
- **Outliers – any points that are away from or off the trend of the other points**

Linear Regression Equation

- Linear Regression 4 on the TI-83 Calculator
- $y = ax + b$ where a is the slope and b is the y - intercept

Correlation Coefficient (r)

- measures the strength and relationship of a linear shape between two quantitative variables, x and y
- positive value of r – positive linear relationship
- negative value of r – negative linear relationship
- r near 0 – weak linear relationship

Correlation Coefficient (r)

- r is between -1 and 1, inclusive
- $r = 1$ or $r = -1$ implies a perfect linear relationship
- the closer r is to 1 or -1 the stronger the linear relationship, the closer r is to 0 the weaker the linear relationship

If your calculator does not display r,

- **press 2nd CATALOG, arrow down to DiagnosticOn,
press ENTER**
- **DiagnosticOn will appear, press ENTER and Done will appear**
- **Repeat STAT, Choose Calc, Choose 4: LinReg(ax + b),
and press ENTER**
- **Now you should see the value of r. You should only
have to do this once for r to appear.**

Residuals

- the vertical distances between the observed data points and the linear regression line on a scatterplot where the linear regression equation is plotted
- The smaller the residuals, vertical distances, the better the linear equation fits the data.



Group Work Session

Two-way Tables, Scatterplots, and Regression Activity

Work with a partner. You will need a
TI-83 Graphing Calculator.

Association vs. Causation

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